

SOME OBSERVATIONS ON PHALACRUS POLITUS
AND OTHER INHABITANTS OF THE HEADS
OF THE NEW ENGLAND ASTER

BY ELIZABETH VON LÖBEN SELS

In the damp fields and roadsides around Ithaca, New York, the clustered heads of *Aster Nova-Angliae* L. loom up in royal splendor during September and October. Toward the close of the latter month, the purple of the ray florets of the head is faded, and the yellow of the numerous disc florets is succeeded by the soft grey of their seed-pappus, upholding here and there an old corolla. At this season, just before the seeds begin to blow away, certain well-fed little larvæ that live in these heads are also ready to leave their bountifully garnished nursery and seek new homes for the coming winter. The Aster head sometimes supports a large number of uninvited guests throughout the autumn; often enough, it is ruthlessly mutilated by these hungry intruders, but usually there are plenty of seeds left.

The Beetle (*Phalacrus politus* Melsh.)

This little black beetle* is one of the interesting seed-eaters in the group of Aster-head inhabitants. Since its hitherto unidentified larva is encountered annually in a study of seed-eating insects by Cornell ecology classes, this study was made to clear up the recurrent perplexing question, "What is this beetle?" The study was begun November 1, 1929, and continued through September, 1930. Work in the field was limited to November and December of 1929. All collecting was done in the environs of Cornell University, Ithaca, N. Y. No observations have hith-

* Family *Phalacridæ*, or shining flower-beetles. Casey monographed them in 1890, and gave further information in 1916; he reports the genus *Phalacrus* to be wide-spread in the Eastern and Southern regions of the United States. The imagines I raised were determined by Dr. W. S. Fisher (Bureau of Entomology), who had access to Casey's types.

Dr. Adam G. Boving generously lent laboratory equipment and advice during a final phase of this study in Washington, D. C.

erto been reported on the habits of this larva, nor has anything been said concerning the pupa.

In Aster heads the grub is well matured toward the close of October. So, also, is the Aster seed, which, though possessing a well developed pappus, is still firmly attached to the floral disc. The presence of a seed-eater may be detected from the state of the pappus. When, instead of being distinct and fluffy, the hairs stick together in a rather hard cone somewhat more compact than a shock of wheat, that is sure indication that seed-eaters are, or have been, at work. The structure has a central flue which is well stuffed at the top by dark, roughly spherical pellets of frass. Later, when surrounding seeds have been borne away by the wind, this "chimney" (which can be lifted intact with the fingers), standing through the winter, reminds one of a deserted wigwam. I never found more than one beetle in a single flower head, although the head is often shared with other insect inhabitants.

The larva attacks the seeds from the base (Fig. 1), ripping

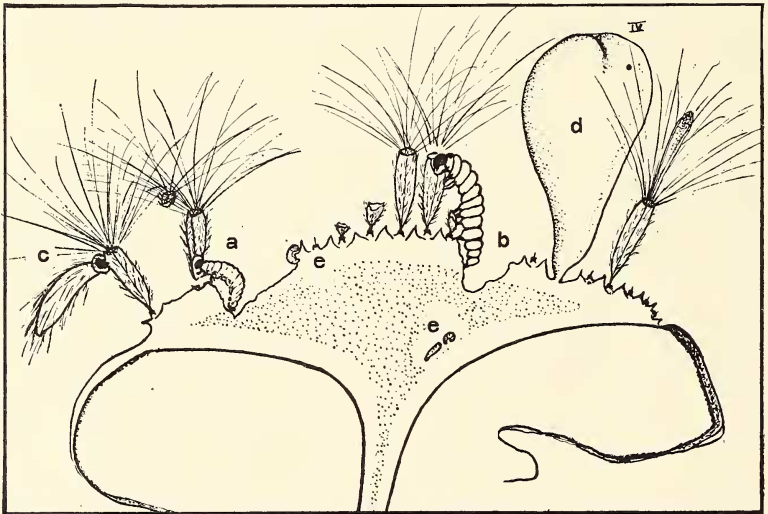


FIG. 1. Diagram of a longitudinal section of an Aster head in early November, showing localization of the infestation. (a) *Phalacrus politus* larva; (b) A caterpillar: three species have this habit; (c) *Coleophora* larva in case; (d) Cecidomyiid flower-gall; (e) Inquiline Dipterous larva (*Cecidomyiidae*).

one up the side and eating it pretty well through before starting another. The pappus is untouched, but in the process the hairs get enmeshed with corolla remnants and form the "chimney." Stuck together by frass as they are, and more or less anchored to the receptacle by a few half-eaten seeds and seed coats, these cones resist the winter winds. The larva often eats holes into the receptacle; these seem usually to be in the shape of wide grooves, and are probably eaten out while the head is still green and soft.

Rearing:—On November 1, 1929, I collected about 100,000 heads of the New England Aster, mostly matured—the seeds just beginning to blow away—and placed them in large paper cones, or funnels. These were approximately 18" in diameter at the top with an opening $\frac{1}{2}$ " wide at the bottom. Upright, they were stood in boxes which had previously been filled to a depth of six inches with carefully sifted soil of sandy clay from the nearest Aster patch. Clean, dampened excelsior was then matted around the base of the cones and over the soil, as a protection against excessive loss of moisture.

Next day, November 2, on examining carefully the loam in one of the indoor boxes, I found seven Phalacrus larvæ. Six others were caught in the base of the cone, about to crawl into the soil. On November 3, without much disturbing, I saw a few larvæ in the bases of all the cones; on the following day, I unearthed several in the very bottom of a box; on the 5th, I again sifted the contents of the set that had been examined on the 2nd, and found 27 larvæ near the bottom. Three of these were imbedded in rough, crumbly, rather irregular cocoons of a clay-like consistency, fastened together by a viscid substance secreted by the larvæ. As evidenced by the increasing numbers in the bases of cones, and in fresh heads brought in from the field—the downward migration continued, albeit with diminishing force, until early in December.

Pupæ:—On June 22, about a third of the cocoons that I opened disclosed pupæ. These are extremely sensitive to light (much more so than are the larvæ); the abdomen wiggles constantly when exposed to daylight and the pupæ show distinct aversion to light of any kind.

Three days later, June 25, at 2 P.M., four imagines were crawling around above ground in my "forced" jar. I watched one take flight: it climbed to the rim of the jar, rested a moment—as though to gather all forces for a supreme effort—opened its tegmina and spread its wings, rose straight up into the air half way to the ceiling, and then aimed directly for the open window and disappeared through it.

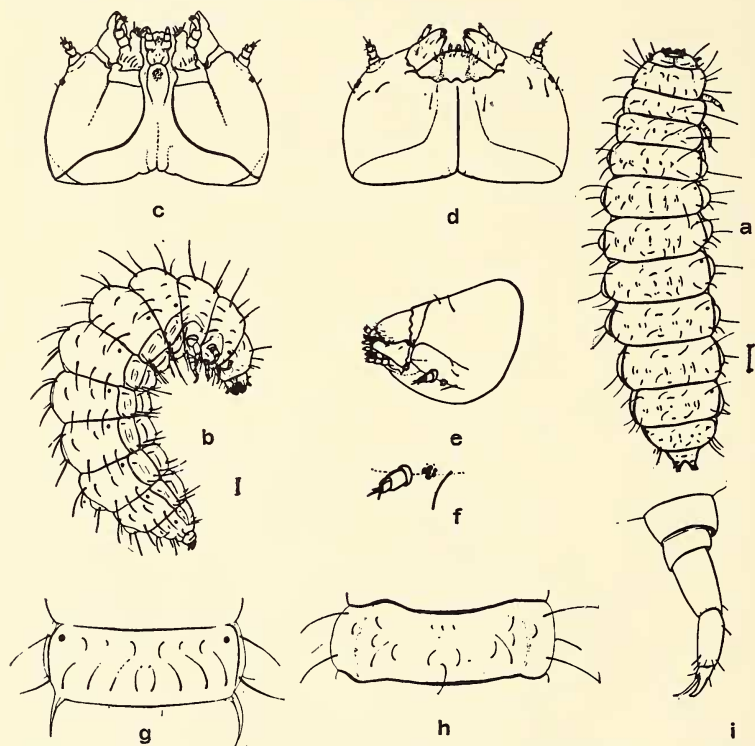


FIG. 2. *Phalacrus politus* larva. (a) dorsal aspect of a full grown larva; (b) lateral aspect of larva in characteristic pose; (c) head, in ventral aspect; (d) head, dorsal aspect; (e) head, lateral aspect; (f) a portion of e, further enlarged, showing eye and antenna of left side; (g) dorsal aspect of third abdominal segment, showing distribution of hairs; (h) ventral aspect of same; (i) a mesothoracic leg.

The Cold Room containers produced their first imago July 7, from one of the pupæ that I discovered June 22. Others appeared in succession until early in August.

Of those reared outdoors, the first three adults to emerge appeared August 9, and, curiously enough, were followed by comparatively few others during the course of the month.

Investigation showed a large number of uniform oval cocoons scattered throughout the soil. These were provisionally determined as belonging to a parasitic wasp, possibly a braconid. On September 15 there emerged a tiny wasp, *Apanteles* n. sp. Unfortunately, it was the only one reared, and the host is uncertain since other larvæ than those of *Phalacrus* were in that outdoor box.

Description.:—The larva of *Phalacrus politus* is smooth, white, rather small, and quite soft, with long brown body hairs (see Fig. 2). There are nine abdominal segments, the last, or anal segment, having fleshy thick lips. The youngest that I found measured 2.5 mm. long by .5 mm. wide; the shape was cylindrical, and the chitinized portions, except for the tip of the mandibles, were a light tan. The mature larvæ are about 4 mm. long by 1.5 mm. wide across the greatest width. These are not cylindrical, but taper somewhat toward the ends. The thorax is nearly .5 mm. narrower than the central portion of the abdomen. This may be slightly enhanced by the typically curled-in position of the resting larva. The larva is concave ventrally. The spiracles (nine pairs), the paired and hook-shaped claws, the terminal appendages (urogomphi), and the head and mouth-parts are well chitinized. As might be expected, the mandibles are short, heavy and strong; they are bifid at the tips, thus forming two teeth of which the outer is the larger.†

The labium and maxillæ have well-developed palpi. The mala—lacina and galea fused—terminate in discs which appear to carry three large and four smaller spines. The mentum is short, with a rather indistinct subgular region. The antennæ are three-segmented, the terminal segments being double. The posterior is the larger of these and supports three bristles. The eyes are small and heavily pigmented. They consist of four

† The mandible of *P. politus* is pictured from one of my specimens in "An Illustrated Synopsis of the Principal Larval Forms of the Order of Coleoptera," by Böving and Craighead, Pl. 35, fig. S, as well as the biforous spiracle, figs. Q, R.

larger ocelli-like structures, two granulated smaller ones, and two dorsal "pin-pricks." The legs are fairly long, consisting of five distinct segments. There are two terminal claws, the posterior one long and slender, and the anterior claw short and heavy, and fused with the tarsal joint into a tarsungulus.

In length, the pupa measures 3 mm.; in width, 2 mm. across the bases of the wing pads. Like the larva, it is more or less depressed in form, but the ventral and dorsal aspects are quite

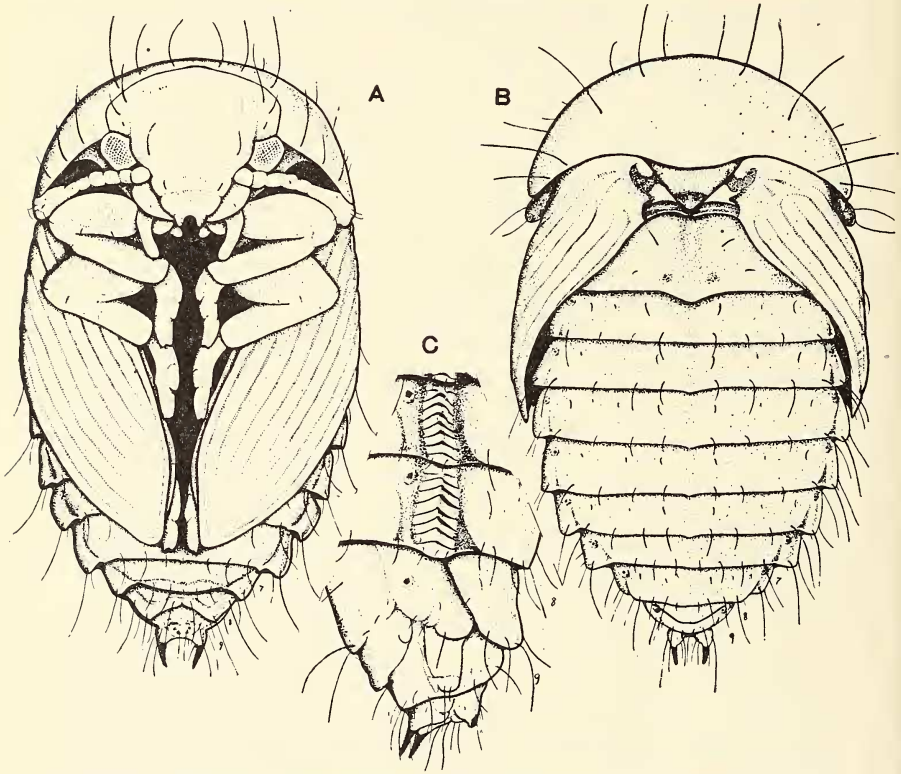


FIG. 3. *Phalacrus politus* pupa. (A) ventral aspect of pupa; (B) dorsal aspect of same; (C) lateral aspect of tip of abdomen.

ovoid (see Fig. 3). The young pupa is white; the more mature show distinct chitinization, especially of the eyes, wing pads, spiracles, and urogomphi.

In *Entomological News*, vol. 5, 1904, p. 140, F. M. Webster notes that he reared the imagines of *P. politus* from heads of rye

affected with smut, the same species being said to breed in smut on corn. He observed larvæ on the heads of rye on July 12; the adults emerged August 4. My observations, however, on *P. politus* larva inhabiting the Aster head (which matures later than rye and corn) are not at all in accord with those of Webster. I found mature larvæ occupying heads in October and November, and hibernating in the soil to emerge in late June (forced), July and early August. May there not be a question of identity of the species, or perhaps of two generations with a possible alternation of host?

OTHER INHABITANTS

Besides the Phalacrus beetle, there are representatives of several orders of insects. Four are seed-eating residents, one is a gall maker, five are transients (including a spider), one is a parasite, and two are of uncertain ecological relations.

The Order Lepidoptera is represented by four species of larvæ; all are undetermined, although one is a *Coleophora* and the others may perhaps belong to the genus *Eucosma*, or some allied genus.

Most abundant of all the inhabitants of the mature Aster heads is one of the latter; a smooth caterpillar of a light tan color. When fully developed, this larva measures 9 mm. in length and 2 mm. in width. Like the beetle, it is a ravenous seed-eater; but there are characteristic differences of habit in that more than one smooth caterpillar may be found in a floral head. The caterpillar, being larger, eats larger holes in the receptacle and consumes more seeds. These it attacks from the top while balanced on its prolegs: first it cuts off most of the pappus and then eats down the seed, stripping off the husk (see Fig. 1, b), and often leaves part of its standing, or pending from the pappus. The "chimney" is a cleaner, prettier structure and as it contains but little frass and is lined and interwoven with silk, this larva seems to find it a comfortable berth between meals. After maturing, the caterpillar lets itself to the ground on a silken strand, buries down a few inches, and sooner or later builds a soft, oval cocoon of silk, gummed externally with sand and earthy particles.

TABLE SHOWING INFESTATION OF 9800 ASTER HEADS

The following table, incorporating the records of counts made as a part of an annual practicum by classes in insect ecology in Cornell University, and in part of counts made by myself in the course of this work, includes what is known of the infestation of New England Aster heads at Ithaca, N. Y.

Date	Class records				Personal records made in 1929				
	Oct. 1927	Oct. 1928	Oct. 1929	Oct. 1929	Nov. 1st.	Nov. 10th.	Nov. 26th.	Dec. 7th.	Dec. 8th.
Number of heads	2500	3000	2300	2300	100	500	300	1000	100
*Smooth caterpillar	245	716	284	284	14	50	27	14	1
*Freckled caterpillar	170	38	93	93	6	15	15	8	2
*Striped caterpillar	0	0	0	0	0	0	1	0	1
Coleophora larvae					0	15	9	0	0
Cecidomyiid galls	62	51	17	17	0	7	16	30	3
Inquiline Dipterous larvae					2	0	12	40	4
<i>Phalacrox politus</i> l.	281	132	86	86	3	30	9	3	0
<i>Anthonomus rufipes</i> a.	0	1	2	2	0	0	0	0	0
Total	758	938	482	482	25	117	89	95	11
**% infested	30.4%	32%	21%	21%	25%	23%	29.6%	9.5%	1%
% infested by <i>P. politus</i> l.	11.24%	4%	3.74%	3.74%	3%	6%	3%	.3%	0%

* Undetermined; possibly *Eucosma*?

** The percentage is computed on the basis that the actual presence of an insect determined an infestation, although frequently over 50% of the Aster heads examined (notably in December), showed evidences of previous infestation.

Another similar caterpillar, distinguishable by faint brownish spots marking the location of the setæ on each segment and looking like pairs of freckles along the dorsum, is a more slender, less abundant larva, of practically the same habits.

Yet another seed-eating caterpillar, with longitudinal dorsal stripes of a tan color, seems rather rare. I found only two specimens.

A fourth Lepidopterous larva, a species of *Coleophora*, is a case-bearer. Its case much resembles the seed in appearance. This likeness is increased when the larva glues bits of pappus to the exterior. The resting position assumed, however, is frequently a revealing one (Fig. 1c).

Another Coleopterous seed-eater is a weevil, *Anthonomus rufipes* Leconte. I found only one adult. It was determined by Mr. L. I. Buchanan of the Bureau of Entomology.

Immature aphids of the genus *Macrosiphum* were found clustered among the floral bracts of several Asters. These were determined by Dr. Edith M. Patch.

Inquiline Diptera, tiny orange-colored Cecidomyiid maggots, were frequently seen in the burrows or among the seed stubble left by Phalacrus or by Lepidoptera larvæ (Fig. 1e).

Cecidomyiid flower-galls were observed on a few of the Aster heads (Fig. 1d). Oval in form and projecting above the florets of the disc, they vary in size and shape. In November, when my work began, all but one of the galls I opened were deserted.

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